OBSERVATIONS ON THE GREAT LAKES.

REPORTS FROM VESSELS.

The Lake Marine Section of the Forecast Division has received reports for November from the captains of 29 vessels navigating the Great Lakes. The following miscellaneous items are extracted from their reports.

Capt. R. E. Gain, s. s. "W. H. Sawyer," November 5, 11 p. m., at Milwaukee, bright aurora in northeast.

Capt. Geo. Holdridge, s. s. "A. D. Thompson," reports a shoal composed of large bowlders not on the Lake Survey charts of Lake Huron, and located east-southeast of Detour light, distant 9 miles; Graveley Islet bore nearly northwest, and a double point on Drummond Island bore northeast-by-north, distant 2 miles; the shoal has 10 feet of water on it and is probably of small extent, there is a depth of 7 fathoms close by.

Capt. George Robertson, schooner "M. A. Lydon," on the 30th lay in the harbor of Charlotte, Lake Ontario, wind-bound on his way to Toronto, and says that this is the poorest port on the Lake at which to get weather information; recommends that greater conveniences be provided.

Capt. J. W. Morgan, s. s. "Australasia," November 1, while passing up the Saint Marys River, "auroras very bright and extending overhead, part of the time very red and then very faint, observed until 10.30 p. m."

Capt. Hugh O. Miller, s. s. "Conemaugh," desires the display of weather signals at Sand Beach rather than Point aux Barques, as his course takes him within 2 miles of the former, but 5 miles of the latter, otherwise he gets no weather signals between Port Huron and Thunder Bay Island.

Capt. C. W. Lockwood, s. s. "B. L. Pennington," at Toledo, on the 14th and 15th, the water in Lake Erie fell 8½ feet during a strong westerly gale with frequent snow squalls.

Capt. John Lowe, s. s. "Kaliyuga," November 1, in the evening, at the northern end of Lake Michigan, observed the northern lights in the east and northeast.

Capt. Edward Mooney, s. s. "Wa-Wa-Tam," November 1, in the eastern portion of Lake Superior, at 5.45 p. m., northern lights; 6.15 p. m., very brilliant from east-northeast to northwest, very red in the northwest, which color lasted twenty minutes; the aurora lasted until 11 p. m.

REPORTS FROM U. S. LIFE-SAVING STATIONS.

Through the kind co-operation of the General Superintendent of the Life-Saving Service and the Secretary of the Treasury, the Weather Bureau has received 153 weekly transcripts of journals for the month of November from the keepers of 39 U. S. Life-Saving stations on the Great Lakes. The following special notes by the respective keepers are extracted from these journals:

Ludington, Mich.—St. Peter, keeper. November 1, northern lights visible from 6 p. m. to midnight.

Vermillion Point, Lake Superior.—S. F. Bernier, keeper. October 31, robins and blackbirds are flying south.

Middle Island, Lake Huron.—Donald McKenzie, keeper. October 29, first snow of the season that lay for any length of time. November 1, a few claps of distant thunder about 8 a. m.; 8 p. m., rain showers; northern lights visible occasionally during the night and continued after midnight till the morning of the 2d.

Oswego, Lake Ontario.—F. W. Anderson, keeper. November 2, between 10 and 12 p. m., thunder squalls with rain and sharp lightning.

SURFACE CURRENTS AND FOG ON THE LAKES.

Mr. N. B. Conger, Inspector, in charge of the Lake Marine Section, in his monthly report for November states that out of 2,000 bottles that have been floated in the different lakes comparatively few have, thus far, been picked up and returned. Out of 800 floated in Lake Superior during this season only 34 have, as yet, been picked up. The general results of this work as to the movements of the water will soon be presented in a special bulletin by the Chief of the Bureau.

Thirteen stations for the display of storm signals have been established at places where they will be of great benefit to the navigators.

The total losses of vessels and lives on the lakes during this season have been 53 vessels and 123 lives; aggregate tonnage 24,258 and aggregate value $1,040,400. Nearly half of this loss was on Lake Erie. The largest single loss has been the collision on Lake Huron of the steamers Philadelphia and Albany in the fog of November 7, 10 miles from the Life-Saving station. The cause of the great number of accidents has been the prevalence of fog, due to the vapor from the warm lake surface.

NOTES BY THE EDITOR.

CLIMATE OF TEXAS.

TREE GROWTH.

Col. William W. Haupt of Kyle, Hayes County, Tex. (N. 30° 0′, W. 97° 50′), communicates the results of measurements made in 1859 by Mr. J. Keuchler, of Gillespie County, Tex. (N. 30° 20′, W. 98° 50′), about 200 miles northwest from the Gulf coast at Indianola. These observations were originally published in the German language in a daily newspaper, the "Zeitung," of San Antonio, and if there be no serious misprints, the general value of the record will not be seriously injured.

Mr. Keuchler seems to have adopted the idea that a tree bears the history of its climatic surroundings written in itself, and that its annual rings of growth vary in size mainly with the supply of water to the roots, so that broad rings indicate wet years and thin rings that can scarcely be distinguished with the naked eye denote dry years. Great care was taken by Mr. Keuchler in the selection of trees for his measurements. He felled three post-oaks, two of which were over 130 years old; they were located upon a high isolated position so that the drought should have an early effect upon the trees, they were also sound and healthy trees. He cut a perpendicular section from each trunk near the thick end, planed its surface very smooth and then varnished it over, which made the annual ring distinctly visible. From each section he prepared a table of the relative order and position of the annual rings; upon comparing these three tables they were found to correspond exactly, thus confirming the idea that moisture is the principal cause of the difference in the breadth of the rings. Although some authors have observed in Texas two quite distinct periods of growth and repose within one year, one of them beginning with the spring and ending with the droughts of early summer the other beginning with the rains of early autumn and ending with the dry cold of winter, yet Mr. Keuchler thought it best to attribute his outermost ring to the growing season of 1858, and counted thence inward and backward, one ring for each year, obtaining the dates given in the next paragraph, which also shows the width of the respective rings, or rather his inference as to the character of the rainfall of each season.

1725–'27, very wet; 1728 and '29, dry; 1730, very wet; 1731 and '32, dry; 1733–'38, wet; 1739–'41, dry; 1742–'57, very wet; 1758, average; 1759–'61, very dry; 1762 and '63, wet; 1764, very dry; 1765–'70, very wet; 1771–'76, extremely dry; 1777–'80, wet; 1781–'83, average; 1784–'87, wet; 1788–'90, dry; 1791, average; 1792 and '93, very wet; 1794, average; 1795–'98, very wet; 1799, very dry; 1800 and '01, very wet; 1802–'05, very wet; 1806–'11, extremely wet; 1812–'18, very wet; 1819, average; 1820, very dry; 1821–'24, very wet; 1825 and '26, average; 1827–'31, very wet; 1832, average; 1833 and '34, very dry; 1835, very wet; 1836, very wet; 1837, dry; 1838, average; 1839 and '40, very wet; 1841, dry; 1842, average; 1843 and '44, dry; 1845 and '46, very wet; 1847, dry; 1848, very wet; 1849 and '50, wet; 1851–'54, average; 1855–'58, dry.

This record of 134 years shows 6 extremely dry; 8 very dry; 19 dry; 17 average; 18 wet; 60 very wet; 6 extremely wet. The large number of very wet years, as given by Mr. Keuchler, is not at all in accord with the rainfall records during the years 1840 to 1890, and, in fact, no region on the globe is known where the distribution of the rainfall is similar to that given by these records. It is evident that the breadth of the annual rings of growth adopted by Keuchler as corresponding to dry and average and wet seasons needs considerable modification, there is no reason conceivable why the rings of average breadth should not be the most numerous, while those corresponding to the unusual extremes of dryness and wetness should be about equally numerous. The tree growth can not be adopted as an index of the rainfall alone unless it is proved by the biologist that rainfall alone affects the growth, which is well known to be far from true. The annual rings certainly depend at least in part upon the evaporation, the sunshine, the temperature, and the distribution of rain in frequent showers or in frequent heavy floods. It is the combination of several favorable meteorological circumstances that must have produced the large number of broad rings which Mr. Keuchler has attributed to 60 very wet years and 6 other extremely wet years. In fact it is best not to attempt to establish any fine details as to the climate from such a record of tree growth, but to content one's self with the general statement that there were 14 years during which the climate was unfavorable for the increase of woody fiber, 54 years during which there was an average favorability, and 66 years that produced large growth owing to very favorable conditions. As the

abundance of water accessible to the roots depends not merely upon the quantity of rainfall but still more upon the style of rain and the character of the soil, and the evaporation due to dry winds, it may be more rational to infer that during 134 years there have been 66 in which the rainfall was well conserved for the use of the tree.

FROSTS IN TEXAS.

Col. Haupt has kept a full record of the weather since 1857; from March, 1857, to November, 1859, his place of observation was Caney, Matagorda County, Tex. (N. 28° 50′, W. 95° 40′), but from January, 1860, to the present date, it was at Kyle, Hayes County, Tex. (N. 30° 0′, W. 97° 50′). From his data he furnishes the following list of frosts, which is presumed to be practically complete and therefore of value:

Frosts in Matagorda County, Texas.

1857.—March 13, killing frost; a week of cold weather. April 6, freezing (thermometer 28°), cotton and corn cut off; 11th, cold weather, hard norther set in; 13th, frost, but not serious; 23d, heavy frost, freezing, killing corn 3 to 6 feet high; 24th, frost.

1858.—November 3, slight frost; 5th, white frost; 9th, first freeze (thermometer 32°).

1859.—March 8, frost and ice; 17th, frost; 31st, frost, but too dry to do damage. April 16, frost, but no serious damage; 23d, heavy frost. October 31, light frost. November 13, everything frozen, ice one inch thick (thermometer 22°); 14th, heavy frost; 18th, frost, followed by very warm weather, with mist and sunshine till the 28th.

Frosts in Hayes County, Texas.

1860.—January, cold weather during month. February 22 and 23, frost and a little ice. March 19 and 20, frost. October 14, frost. November 24, frost, first freeze. 1861.—November 23, very light frost. 1862.—February 20, heavy frost. 1863.—January 15, frost, freezing; 16th, heavy frost, killing vegetation; 17th, frost, freezing; 28th, heavy frost and freeze. 1863.—February 4, heavy frost and freeze. October 24, frost and ice. 1864.—February 29, sleet during day; rained and froze, covering every twig with ice an inch thick. May 11, very light frost. October 5, 9, and 22, very light frost. November 20, ice ½-inch thick. December 22 and 23, heavy frost.

1865.—January 23, freezing all day. February 9, freezing and sleeting. April 22, light frost. November 2, heavy frost at Austin. 1866.—December 7, first freeze; heavy frost. 1867.—November 5, frost. 1868.—November 1, frost, with other light ones occasionally until the 16th. 1870.—November 16, light frost, first of the season; 22d, white frost; 25th, first ice. 1871.—November 19, first frost of season; 20th, sharp frost; 29th, first ice; 30th, ice and sleet. December 1, 2, and 5, ice and sleet.

1873.—October 29, first frost; 30th, sharp frost. 1877.—November 10, frost and slight freeze; 11th, heavy frost. 1879.—January 12, heavy frost. October 25, frost. November 19, frost. 1880.—March 22, freezing. 1881.—November 2, light frost. 1882.—March 9, heavy frost and ice. 1883.—November 16, frost. 1884.—November 20, heavy killing frost. December 18, heavy killing frost. 1885.—February 14, heavy frost. 1887.—February 4 and 5, sleet. November 28, first freeze. 1888.—October 23, frost. November 9 and 10, frost; 22d, first ice. 1891.—November 8, first frost. 1893.—January 19, first freeze. November 15, first frost.

NORTHERS IN TEXAS.

Col. Haupt also furnishes the following list of northers observed by him at Caney and Kyle:

Northers in Matagorda County, Texas.

1857.—April 11, heavy norther. May 2, heavy norther.

1859.—March 17, heavy norther. April 2, 14, and 21, norther; 22d, severe norther. May 27, cold north wind. September 4, norther; cold, requiring fires and overcoats; 19th, norther. October 17, norther in the night; 27th, norther before day. November 12, norther, with light rain, severe wind all day and following night; 13th, wind moderated in the morning; 17th, high wind from south till 11 o'clock when high, dry norther set in and calmed off at night; 28th, light norther. December 1, norther at night; 5th, norther at night, very severe by daylight; 6th and 7th, heavy wind.

Northers in Hayes County, Texas,

1860.—February 28, norther in evening. March 15, norther. April 22, norther; 28th, cold north wind; 30th, norther. May 8, norther. September 6, breeze from north; 14th, cool north wind. November 6, light norther; 22d, norther; 27th, severe cold norther; 28th, norther, still blowing. December 4, norther; 21st, norther, but clear; 28th, north wind, increasing as the day passed; 29th, north wind continued; 30th, high wind all day.

1861.—January 10, high norther; 14th, norther; 23d, cold norther, freezing at night, with continued wind; 24th, wind from north all day. April 14, heavy norther. August 1 to 4, norther lasting three or four days, followed by rain. September 25, norther during early part of the night. November 22, clear norther blew. December 12, norther began after dark and lasted forty-eight hours; 20th, light norther; 26th, norther.

1862.—January 12, brisk wind at sunset from northeast, veered to northwest; 27th, north wind and rain. February 4, last eight days wind blew first sixty hours very hard from the south balance of time from the north. 8th, 9th, 14th, and 15th, cold norther; March 18, norther. April 21, high wind; 24th, norther. September 10, norther at night. October 24, norther.

1863.—January 14, severe norther. February 4, severe norther. April 11, norther. May 6, norther blowing, cool and clear. August 24, norther, with lightning in the north. September 17, norther. November 6, norther.

1864.—March 10 to 17, constant north wind; 24th, high wind and cold; 27th, high south wind, followed by norther. April 7 and 14, cold norther. May 27, norther at night. June 15, cool norther. August 20, norther and northeaster blowing for last 48 hours. October 1, 4, 20, and 21, norther. November 2, norther blew terrible gusts; 8th and 9th, norther blew with great violence; 17th, norther lasted forty-eight hours. December 2, mild norther in the evening; 8d, norther, blew moderately.

1865.—January 10, cold norther; 13th, norther, began at midnight; 21st, norther about 4 p. m.; 24th and 25th, north wind all day; 26th northeast wind all day; 27th, cold northeast wind all day; 28th and 31st, cool northeast wind all day. February 1, moderate east and north wind; 4th, wind northeast in the morning, northwest in the evening; 5th, wind in the north; 12th, wind northeast; 13th and 14th, light norther; 17th and 21st, strong north wind; 22d and 23d, northeast wind; 24th, northeast wind, northwest in the evening. March 9 and 10, high winds. April 19 to 21, continuous north wind. May 1 and 6, cool norther blowing from last evening; 8th, cool norther, still blowing. November 2, norther. December 12, heavy norther.

1866.—February 14, heavy norther all day; 15th, norther still high. September 19, norther.

1867.—October 4 and 5, strong wind from the north; 15th and 22d, norther; 30th, wind from the north since the 26th.

1868.—January 6 to 10, very cold norther, lasting 107 hours. March 10, sharp norther. September 16, norther, blowing quite cool; 22d, sharp norther at sunset. October 7, norther at 1 p. m. November 16, norther. December 13, norther.

1869.—February 2 to 3, norther; ice morning of 3d; 21st, east of north norther in early morning. March 24, heavy norther, blowing hard and cold all day. September 7, strong norther.

1870.—September 1, cold north wind. October 15 to 19, wind generally from the north during flood.

1871.—October 30, cool norther in the morning. December 3, cool norther.

1879.—January 11, wind from west veering to northwest at night. September 9, north wind for six days past. October 16, norther, continuing to 29th. December 19, severe norther (see frosts).

1880.—December 29, coldest wind on record.

1881.—February 10–11, cold north wind.

1882.—January 16, norther, with sleet. March 5, norther in evening.

1883.—April 21 and 22, norther. August 12–17, norther, wind from north, weather warm; 24–30th, norther, cool.

1885.—August 31, north wind for past five days. September 3, north wind for past three days.

1886.—June 19–25, cool north wind. September 23, north wind, first norther; 29th, north wind.

1887.—January 3, north wind, clear; 9th, north wind, wet; 10th, north wind, clear. August 6 and 24, north wind. September 28, first norther. October 12 and 24, north wind. November 11 and 27, north wind. December 13 and 24, north wind.

1888.—January 15, 18, and 19, north wind. February 2, 4, 10, 15, and 22, north wind. March 3 and 18, north wind. April 12, 18, and 23, north wind, May 10, 12, 28, 29, and 30, north wind. June 24 and 26, north wind. August 13, northeast wind. October 21 and 22, north wind. November 16–20, 22, 25, and 26, north wind. December 8, 25, and 29, north wind.

1889.—February 24, north wind. March 1, 22, and 31, north wind. April 3, 12, and 30, north wind. May 1, 2, 13, and 18, north wind. December 30, north wind.

1890.—April 2, 16, and 19, north wind. June 6 and 7, north wind. September 19, 22, 24, 25, and 26, north wind. October 12, north wind. November 11 and 16, north wind. December 6 and 8, north wind.

1891.—May 25–27, north wind. June 6, 16, and 29, north wind. August 1 and 29, north wind.

1892.—May 21 and 22, north wind. August 1, 14, 15, and 24, north wind. September 7, first norther; 11th, second norther.

1893.—May 7 and 8, north wind. August 1 and 30, north wind. September 5, 9, 10, and 11, north wind. November 12–14, north wind.

THE EARTHQUAKE OF NOVEMBER 27TH.

Although earthquakes have little to do directly with meteorology, yet the students of geology need for their study as many observations as possible of the exact time and nature of even the slightest earthquake tremor. In order to assist in the study of this subject, the Weather Bureau has always indorsed the policy adopted by meteorologists throughout the world of encouraging its observers to observe and record this earthquake phenomena. Those who desire to add somewhat to the accuracy of the records should make use of some one of the many forms of the seismoscope, such as the simple ones described in the Annual Report of the Chief Signal Officer, 1875, p. 847, or the more sensitive form perfected by Profs. Gray, Mendenhall, Marvin, and others, and recommended by the Geological Survey (see also the apparatus described in the article "Earthquake" in the American Cyclopedia, published by the Appletons). Those who have no instruments, and not even an exact timepiece, should pay especial attention to the frequency and the number of the several slight tremors that usually accompany the main shock; they should notice the apparent direction of movement of buildings and the ground at as many places as possible in the neighborhood, since the movement often varies

very much on the opposite sides of a hill or valley. In describing the results of such observations, observers should omit references to their theories as to the nature and origin of an earthquake shock unless, indeed, they collect observations especially adapted to test definite theoretical hypotheses.

Numerous reports have been received of an earthquake shock on November 27, which was felt between 11.42 a. m. and noon of that date, throughout northern New England and eastern Canada. A special description of this earthquake will be found in the November Bulletin of the New England Weather Service.

In connection with this earthquake, the Editor would remark that although the center of this disturbed area was probably not far from Quebec, yet it is by no means necessary to conclude that there is a region extending from 50 to 100 miles northeast of Quebec in which an almost extinct volcano is slowly expiring. An earthquake has, in fact, no necessary connection with a volcano; volcanic eruptions produce slight earth tremors in their neighborhood, but earth tremors and severer earthquakes occur without depending upon volcanic eruptions. It is more plausible that the dislocation of strata attending an earthquake may produce vents through which volcanic eruptions subsequently take place. We must consider the surface of the earth to a depth of at least 50 miles as being in a state of strain. This strain is produced by numerous causes, among which may be mentioned, first, the contraction of the solid crust due to cooling; second, the expansion due to the slow crystallization of sedimentary strata as they are converted into crystalline rock; third, the pressures involved in the evolution of steam and other gases; fourth, the strain produced by the upward pressure of liquid lava forced up through cracks in the lowest strata and seeking to break through the upper strata; fifth, the strains produced by the weight of the ocean on its bed, or of mountains on their bases; finally, the enormous strains produced by the differential attractions of the sun and moon on various portions of the revolving earth and the strains due to the centrifugal force of that revolution.

Of all these causes, the centrifugal and tidal forces are, at the present time, probably most effective in producing the gradual uplifting of continents and mountain chains. A large majority of the earthquake tremors and shocks are due to the actual giving way of the geological strata under these immense strains; sometimes a set of inclined strata slide over each other a few inches, at other times a compressed stratum cracks and one portion is shoved up higher than the other by a few inches, forming the "faults" that one sees everywhere in the rocks. In this way, apparently, the great geological anticlinals and synclinals were formed; the range of the Rocky Mountains and the Andes represents a general rise, step by step, during many ages, and which is even now going on, while the other western portion of the stratum has not been elevated and underlies the Pacific Ocean. If lava and volcanoes burst up along the line of such a cleft in the rocks we must attribute the possibility of volcanoes to the occurrence of earthquakes and not *vice versa*. There are probably very few cases in which volcanoes should be spoken of as the ultimate cause of earthquakes.

There are numerous regions in the United States within which earthquake tremors are very frequent, and such frequency may plausibly be considered as indicating one of two alternatives, viz., either the strains are particularly frequent and severe in those regions, or else the geological strata thereabouts are strained in such a manner as to render it particularly easy for them to give way suddenly and become slightly dislocated so as to form new cracks and "faults." When these earthquake areas occur in hilly or mountainous countries, we conclude that the mountains are but the present results of a similar set of dislocations that have been going on through several geological ages; when an earthquake area is confined mainly to a river valley we connect it with the arrangement of strata that made that valley a possibility. But without adopting any hypothesis as to the origin of special earthquake regions we must, for the present, and as observers merely, be content to collect the observations for the use of the geologists.

RELATIVE INTENSITY OF WEST INDIAN STORMS.

By Prof. H. A. HAZEN.

In the following table the column on the left gives the year and those on the right give for each year and month two horizontal rows of figures, D and I; in the upper horizontal row (D) is given the date of the beginning of the storm, as far as reports are at hand, and in the lower row (I) is a figure indicating relative intensity.

This table has been prepared by Prof. Hazen in connection with his study of the storms of the western portion of the Gulf of Mexico; it comprises all the storms of which mention has been made in the MONTHLY WEATHER REVIEW or in the "Monthly Summary of International Observations," as originating east of the 100th meridian and south of the 30th parallel.

The date of the origin is taken as the day when the first increasing, or violent winds, are noted. The scale of intensity is relative and depends in part upon the violence of the wind and in part on the extent of the storm.

Storms in the neighborhood of the West Indies during August, September, and October, from 1874 *to* 1893.

	August.				September.					October.								
1874, D					2	8	25											
I					3	1	3											
1875, D	1	6	13		9	24				13								
I	1	1	1		3	1				2								
1876, D					12					19								
I					2					3								
1877, D	2				14	17	21			16	24							
I	1				3	2	3			1	1							
1878, D	12	24			1	12	24	29		9	13	18						
I	2	1			3	1	2	1		2	1	3						
1879, D	13	16	20	30	8	12				3	10	25						
I	1	3	1	2	1	1				1	2	2						
1880, D	5	12	15	24	7					1	5	7	20	27				
I	2	2	2	3	1					1	2	1	2	2				
1881, D	1	16	22	27	9	14												
I	1	1	3	2	1	1												
1882, D	29				2	22				6								
I	1				3	1				3								
1883, D	15	23			4					8	22							
I	3	2			3					1	2							
1884, D					3	10				7	11	21						
I					2	2				2	2	1						
1885, D	8	23	30		15	18	24	26		10								
I	2	2	1		1	1	2	2		2								
1886, D	6	13	15	19	22	24				1	7	22						
I	1	2	3	3	2	1				2	3	2						
1887, D	5	15	19	30	1	11	15	24		6	8	9	11	14	16	22	28	29
I	1	3	3	2	1	2	1	1		1	1	2	2	1	3	1	2	2
1888, D	16	31			7	24				10	24							
I	2	3			1	1				1	1							
1889, D	8	20	25		1	4	13			1	4							
I	1	1	1		3	1	3			2	2							
1890, D	11	23	27		4					2	22							
I	1	1	3		1					1	1							
1891, D	18	26			6	11	14	18	25	1	6	13						
I	3	1			2	1	1	2	1	1	3	2						
1892, D	16				11					1	6	13	22	28				
I	3				2					1	2	3	3	1				
1893, D	15	20	22	29	1	5				1	21							
I	2	2	3	1	1	2				3	1							

METEOROLOGICAL TABLES.

Meteorological record of voluntary and other co-operating observers, November, 1893.

Stations.	Temperature. (Fahrenheit.) Max.	Min.	Mean.	Precip'n.	Stations.	Temperature. (Fahrenheit.) Max.	Min.	Mean	Precip'n.
Alabama.	°	°	°	*Ins.*	*Alabama*—Cont'd.	°	°	°	*Ins.*
Alco	79	27	55·7	.....	Geneva†	83	27	55·8	3.02
Bermuda†	76	26	53·0	4.15	Greensboro†[1]	80	25	54·3	3.22
Birmingham†	78[d]	33[d]	50·2[d]	2.13	Healing Springs†	80	25	55·1	5.20
Brewton*†[5]	85	25	55·5	4.87	Highland Home†	76	27	55·9	3.16
Carrollton*†[1]	74	22	51·7	2.90	Livingston*b†[1]	79	22	53·4	2.98
Chepultepec	77[d]	15[d]	48·7[d]	2.03	Lynn*a†				2.60
Citronelle†	77	32	57·4	4.04	Maple Grove	86	16	52·8	2.73
Claiborne Landing†				2.88	Marion†	76	26	55·5	1.91
Cordova†				3.59	Mount Willing†	77	28	56·6	3.15
Decatur*b†	76	15	47·6	1.39	Newbern†	77	26	53·2	3.37
Elba*†[1]	70	30	55·4	3.28	Newburg†	79	16	49·4	2.10
Eufaula*a†	84	29	58·8	3.02	Newton†[1]	80	28	56·0	2.87
Eufaula*c†				2.32	Opelika†	76	24	54·6	1.08
Evergreen†	80	28	55·8	4.55	Oxanna*†[1]	75	22	52·1	1.37
Florence*a†				2.31	Pine Apple†	78	22	53·8	3.26
Florence*b†[1]	77	20	49·7	1.95	Pushmataha†	76	29	55·0	4.50
Fort Deposit†	79	26	54·2	.....	Rock Mills				2.41
Gadsden†	76	21	50·9	1.70	Scottsboro†	74	20	49·4	1.64

Meteorological record of voluntary observers, &c.—Continued.

Stations.	Temperature. (Fahrenheit.) Max.	Min.	Mean	Precip'n.	Stations.	Temperature. (Fahrenheit.) Max.	Min.	Mean	Precip'n.
Alabama—Cont'd.	°	°	°	*Ins.*	*Arizona.*	°	°	°	*Ins.*
Selma*a†				3.10	Antelope Valley†				1.71
Starlington*[1]	78	28	54·7	2.81	Arizola†[1][s]	80	36	53·1	0.50
Sturdevant†				1.06	Ariz. Canal Co. Dam	87	42	64·4	0.46
Talladega*a†				2.15	Benson*[s]	80	30	54·0	0.00
Talladega*b†[1]	77	23	52·5	1.90	Buckeye†	89	33	59·3	1.60
Tallassee Falls†				3.06	Calabasas†	77	28	49·2	0.35
Thomasville†	80	24	55·2	5.14	Casa Grande*[s]	89	35	60·3	0.00
Tuscaloosa†				2.88	Crittenden*†[5][k]	83	19	49·9	0.49
Tuscumbia*b†	75	20	49·5	2.35	Dragoon Summit*[5]	78	35	58·4	0.00
Union Springs*a†[1]	80	23	55·2	2.77	Dudleyville†	81	32	53·5	1.10
Union Springs*b†	76	25	54·5	2.71	Farleys Camp	71	43	57·8	1.50
Uniontown†	78	28	56·7	3.10	Flagstaff†	70	11	41·4	1.70
Valley Head†	76	16	48·8	1.95	Florence†	84	37	56·6	0.43
Warrior†				2.55	Fort Apache	70	20	43·6	0.28
Wilsonville†				2.10	Fort Bowie†	77	29	52·0	0.07
Alaska.					Fort Grant	77	24	51·4	0.40
Killisnoo†[1]	47	1	29·4	4.10	Fort Huachuca	78	24	49·9	0.37
Metlakahtla†	49	8	32·0	9.69	Fort Mohave	84[f]	39[d]	56·7[d]	0.28
					Gila Bend*[s]	78	35	53·2	1.25